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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,091	10/23/2003	Lotien Richard Huang	10434/60701	8466

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EXAMINER	
NOGUEROLA, ALEXANDER STEPHAN	
ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 08/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/693,091	Applicant(s) HUANG ET AL.	
	Examiner ALEX NOGUEROLA	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 10-17 and 28-35 are rejected under 35 U.S.C. 102(e) as being anticipated by Chan et al. (US 6,762,059 B2), hereafter "Chan."

Addressing claim 10, Chan teaches a microfluidic device for separating particles according to size (abstract) comprising

a microfluidic channel (Figures 4A-4M and col. 38, ll. 23-29), and

an ordered array of obstacles within the microfluidic channel (Figures 4A-4M), wherein

the device employs a field that propels the particles being separated through the microfluidic channel (col. 39, ll. 55-64); and

the ordered array of obstacles is asymmetric with respect to the average direction of the field (array embodiments shown in Figures 3B(xv), 3B (xvii), and 3B(xviii)).

Addressing claims 11 and 29, laterally shifted rows as claimed are disclosed by Chang (array embodiments shown in Figures 3B(xv) and 3B(xviii)).

Addressing claims 12 and 30, a tilted array as claimed is disclosed by Chang (array embodiment shown in Figure 3B(xviii)).

Addressing claims 13, 15, 31, and 33, Chan discloses at least capillary action, a hydrodynamic field, and an electrical field (col. 39, ll. 56-64; col. 40, ll. 8-32; and col. 40, ll. 41-45).

Addressing claims 14 and 32, a hydrodynamic field involves fluid flow.

Addressing claims 16,17, 34, and 35, Chan discloses particles that are macromolecules such as DNA and proteins (col. 16, ll. 5-24).

Addressing claim 28, Chan teaches a method for separating particles according to size (abstract) comprising

introducing the particles to be separated into a microfluidic channel (implied by col. 38, ll. 55-59 and col. 38, ll. 56-64, which teach driving particles through the channel) comprising ordered array of obstacles (Figures 4A-4M), wherein

applying a field to the particles to propel the particles through the microfluidic channel (col. 39, ll. 55-64); and

wherein the ordered array of obstacles is asymmetric with respect to the average direction of the field (array embodiments shown in Figures 3B(xv), 3B (xvii), and 3B(xviii)).

3. Claims 10, 13-17, 28, and 31-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Austin et al. (US 5,837,115), hereafter "Austin."

Addressing claim 10, Austin teaches a micro fluidic device for separating particles according to size (abstract) comprising

a micro fluidic channel (24) (see col. 11, ll. 49-62), and

an ordered array of obstacles within the microfluidic channel (38), wherein

the device employs a field that propels the particles being separated through the microfluidic channel (abstract and col. 10, ll. 1-13); and

the ordered array of obstacles is asymmetric with respect to the average direction of the field (embodiment shown in Figure 14).

Addressing claims 13, 15, 31, and 33, Austin discloses at least electrical, electrophoresis, and hydrodynamic fields (abstract; col. 13, ll. 16-22; and col. 19, ll. 18-21).

Addressing claims 14 and 32, a hydrodynamic field involves fluid flow.

Addressing claims 16, 17, 34, and 35, Austin discloses separating macromolecules, such as DNA, and cells (col. 1, ll. 30-34 and col. 3, ll. 29-35).

Addressing claim 28, Austin teaches a method for separating particles according to size (abstract) comprising

introducing the particles to be separated into a microfluidic channel (Figures 1 and 2) comprising ordered array of obstacles (38), wherein

applying a field to the particles to propel the particles through the microfluidic channel (abstract and col. 10, ll. 1-13); and

wherein the ordered array of obstacles is asymmetric with respect to the average direction of the field (embodiment shown in Figure 14).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-9 and 18-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Austin et al. (US 5,837,115), hereafter "Austin."

Addressing claim 1, Austin teaches a microfluidic device for separating particles according to size (abstract and col. 11, ll. 20-29) comprising

an array (38) comprising a network of gaps (54) within the microfluidic channel (Figures 2-4A and 6), wherein

the device employs a field that propels the particles being separated through the micro fluidic channel (abstract and col. 10, ll. 1-13); and wherein

a flux of the field from the gaps is divided equally into subsequent gaps (embodiments in Figures 7 and 8, for example) or unequally into subsequent gaps (embodiment shown in Figure 14).

Austin does not specifically mention configuring the array so that the "flux of the field from the gaps is divided unequally into a major flux component and a minor flux component into subsequent gaps in the network such that the average direction of the major components is not parallel to the average direction of the field." However, barring a contrary showing, such a configuration of the array is just a matter of optimizing the array for the particles to be separated.

Austin clearly contemplates a wide variety of possible configurations for the array. As mentioned above, Austin discloses arrays in which "a flux of the field from the gaps is divided equally into subsequent gaps (embodiments in Figures 7 and 8, for example) or unequally into subsequent gaps (embodiment shown in Figure 14)." Austin states,

> Although Fig. **3** illustrates obstacles **39** as being positioned within array **38** in an ordered and uniform pattern, it is within the scope of the present invention to have a staggered pattern, or any desired predetermined and reproducible pattern. *col. 10, ll. 41-45.*
>
> It is an important feature of the present invention that any pattern of array **38** of obstacles **39** can be designed within the scope of the present invention. The array **38** can comprise an ordered, evenly spaced formation wherein the obstacles are positioned in uniform rows and columns. Alternatively, array **38** may comprise a staggered formation wherein positioning of the obstacles is not uniform but scattered around the array. Further, array **38** may comprise a mixture of such arrangements disposed along the migration direction M traversing same. *col. 13, ll. 56-65.*
>
> Additionally, an optimum design can be perfected over time by making minor changes to the arrays for each new experiment until the most preferred design is obtained. *col. 14, ll. 54-57.*

Thus, the disclosure of Austin includes a wide variety of configurations for the array, which although it does not specifically mention the claimed unequal dividing of the flux into a major flux and a minor flux as claimed, does render it an obvious optimized configuration.

Addressing claims 2-4 and 19-22, as with claim 1, barring a showing of unexpected results, in view of the teaching of Austin the particular configuration of the array is just a matter of optimizing the array for the particular particles to be separated.

Addressing claims 5, 7, 23, and 25, Austin discloses at least electrical, electrophoresis, and hydrodynamic fields (abstract; col. 13, ll. 16-22; and col. 19, ll. 18-21).

Addressing claims 6 and 24, a hydrodynamic field involves fluid flow.

Addressing claims 8, 9, 26, and 27, Austin discloses separating macromolecules, such as DNA, and cells (col. 1, ll. 30-34 and col. 3, ll. 29-35).

Addressing claim 18, Austin teaches a method for separating particles according to size (abstract and col. 11, ll. 20-29) comprising

introducing the particles to be separated an array (38) comprising a network of gaps (54) within the microfluidic channel (Figures 2-4A and 6); and

applying a field to the particles to propel the particles through the micro fluidic channel (abstract and col. 10, ll. 1-13);

wherein a flux of the field from the gaps is divided equally into subsequent gaps (embodiments in Figures 7 and 8, for example) or unequally into subsequent gaps (embodiment shown in Figure 14).

Austin does not specifically mention configuring the array so that the "flux of the field from the gaps is divided unequally into a major flux component and a minor flux component into subsequent gaps in the network such that the average direction of the major components is not parallel to the average direction of the field." However, barring a contrary showing, such a configuration of the array is just a matter of optimizing the array for the particles to be separated.

Austin clearly contemplates a wide variety of possible configurations for the array. As mentioned above, Austin discloses arrays in which "a flux of the field from the gaps is divided equally into subsequent gaps (embodiments in Figures 7 and 8, for example) or unequally into subsequent gaps (embodiment shown in Figure 14)." Austin states,

> Although Fig. **3** illustrates obstacles **39** as being positioned within array **38** in an ordered and uniform pattern, it is within the scope of the present invention to have a staggered pattern, or any desired predetermined and reproducible pattern. *col. 10, ll. 41-45.*
>
> It is an important feature of the present invention that any pattern of array **38** of obstacles **39** can be designed within the scope of the present invention. The array **38** can comprise an ordered, evenly spaced formation wherein the obstacles are positioned in uniform rows and columns. Alternatively, array **38** may comprise a staggered formation wherein positioning of the obstacles is not uniform but scattered around the array. Further, array **38** may comprise a mixture of such arrangements disposed along the migration direction M traversing same. *col. 13, ll. 56-65.*
>
> Additionally, an optimum design can be perfected over time by making minor changes to the arrays for each new experiment until the most preferred design is obtained. *col. 14, ll. 54-57.*

Thus, the disclosure of Austin includes a wide variety of configurations for the array, which although it does not specifically mention the claimed unequal dividing of the flux into a major flux and a minor flux as claimed, does render it an obvious optimized configuration.

8. Claims 36-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. (US 6,762,059 B2), hereafter "Chan."

Addressing claim 36, Chan teaches a microfluidic device for separating particles according to size (abstract) comprising

multiple arrays in series within the microfluidic channel, wherein each array has a different critical size (embodiment shown in Figure 4H),

and wherein

the device employs a field that propels the particles being separated through the microfluidic channel (col. 39, ll. 55-64).

In the embodiment shown in Figure 4H none of the arrays comprises a network of gaps wherein the flux of the field from the gaps is divided unequally into a major flux component and a minor flux component into subsequent gaps in the network such that the average direction of the major components is not parallel to the average direction of the field. However, barring evidence to the contrary, such as unexpected results, to have the arrays so configured is just a matter of optimizing the arrays for separating the particles of inters. Chan discloses many configurations of arrays including an array configured with gaps wherein the flux of the field from the gaps is divided unequally into a major flux component and a minor flux component into

subsequent gaps in the network such that the average direction of the major components is not parallel to the average direction of the field (Figure 3B(xvii)). It is clear that Chan contemplated selecting the best array or combination of arrays for the particles of interest (col. 29, ln. 25 – col. 30, ln. 24).

Addressing claim 37, as seen in Figures 3B(xvii) and 4H Chan contemplated ordered arrays of obstacles.

Addressing claim 38, the array in Figure 3B(xvii), which would be substituted for each of the arrays in Figure 4H, has laterally shifted rows as claimed.

Addressing claim 39, the array in Figure 3B(xvii), which would be substituted for each of the arrays in Figure 4H, has titled obstacles as claimed.

Addressing claim 40 and 42, Chan discloses at least capillary action, a hydrodynamic field, and an electrical field (col. 39, ll. 56-64; col. 40, ll. 8-32; and col. 40, ll. 41-45).

Addressing claims 41, a hydrodynamic field involves fluid flow.

Addressing claims 43 and 44, Chan discloses particles that are macromolecules such as DNA and proteins (col. 16, ll. 5-24).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alex Noguerola
Primary Examiner
AU 1753
August 2, 2004